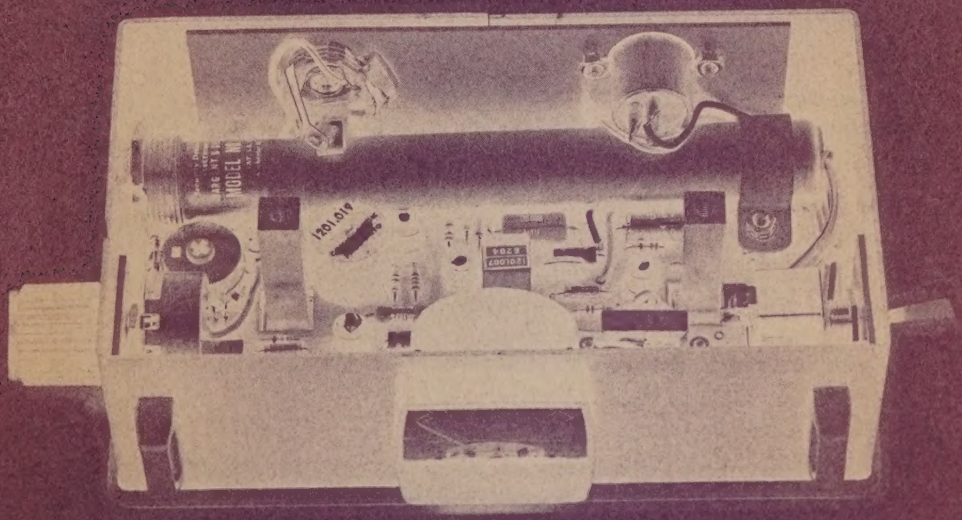
Service Instructions
for
ULTRASONIC TRANSLATOR detector
MODEL 117



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DELCON
CORPORATION

943 INDUSTRIAL AVENUE
PALO ALTO, CALIFORNIA, USA
TELEPHONE 415-321-8200

HEWLETT PACKARD hp DELCON DIVISION

943 Industrial Avenue, Palo Alto, California 94303 AREA CODE 415 321-8200

USE OF THE DELCON ULTRASONIC TRANSLATOR DETECTOR

1) General: The VOLUME control should be set at approximately mid-range for initial scanning of an area for leaks. Reducing the volume control setting will have the effect of sharpening the response cone of the detector as well as to minimize interference from adjacent large leaks.

Be certain to point probe in all possible directions where leaks can occur. Large overhead leaks can often create sonic reflections thereby giving a false indication of a leak. The leak source is always louder than the reflections.

Before entering an area such as a large room, stand at the entrance and scan the entire area for an indication of leaks; otherwise you may follow an apparent reflection from a leak behind your back.

Under certain circumstances the user of the Delcon instrument may not have the advantage of a demonstration prior to initial use of the equipment. If this is the case, it is recommended that a typical leak be simulated to enable the operator to get the "feel" of the instrument. It is desirable to have a means of adjusting both the size of the leak and the pressure of the system. A few minutes spent in this manner will greatly help the user learn what to anticipate with the equipment in actual leak testing.

2) Loud Background Noise: In facilities such as refineries and chemical plants, locomotive repair shops, large steam and compressed air leaks are often encountered. These leaks can create an extremely high ultrasonic background noise level which tend to limit the effectiveness of the detector. It is then necessary to adjust the volume control to minimum and hold the probe close to the equipment being leak tested. In severe situations it is important to use the 03000 focusing extension in order to eliminate unwanted noise from entering the probe.

Be aware of the location of certain pneumatic controls and valves which have intentional bleed systems.

To minimize the effect of large leaks and reflections, try approaching a suspected leak area from another direction.

Use headset in noisy areas.

3) Vacuum Leak Testing: Certain test applications will require the locating of small holes in vacuum systems which may be under partial vacuum. It has been found that the use of a fluid such as distilled water or ether will amplify the sounds.

To use this technique, point the general purpose probe toward the area being examined and apply the liquid by either a spray or brush. The small droplets will be pulled into the vacuum system and will explode into the leak area. Experiments indicate that with only 2.5 psi vacuum differential, a hole 0.0005 inch in diameter can be easily pin-pointed. This system has been used very effectively at Ames Research Center (NASA), California.

4) Sensitivity to Vacuum Leaks: The ultrasonic testing technique provides a constant sensitivity regardless of the size of the vacuum vessel or system being tested. Other systems which require the use of a tracer gas quickly lose their rated sensitivity as the volume of the container is increased.

5) Multiple Leaks: When multiple leaks are found, it is generally helpful to temporarily seal the leaks by means of tape or clamps and continue to search the area for additional leaks.

6) Internal Leaks-Pressure Regulators, Valves: When there is flow through a pressure regulator (often the indication of a leak) it is possible to detect this flow by listening to the regulator. Internal leaks of this type often sound "hollow" as compared to the "hiss" of a leak to the atmosphere. Using this technique it has been possible to determine that a leak existed in the oxygen system of a jet aircraft, i.e., there was flow through the regulator when all valves and outlets were in the "off" position.

7) Remote Locations: Delcon detectors are designed with low impedance probe output thereby permitting the use of an extended cable between the probe and the instrument. The probe can be placed at the end of an extension pole for remote searching if desired. Standard 25-foot extension cables (P/N 74013) are available from Delcon stock.

8) Exposure to Moisture: The standard 72004 General Purpose Probe will temporarily lose sensitivity when exposed to moisture such as steam or direct rain. A simple method of preventing this loss of sensitivity is to remove the rubber screen cap from the end of the probe and place a sheet of thin mylar or plastic over the probe end. Then replace the rubber screen protector. The plastic should not be stretched too tightly as this will lower the sensitivity of the probe. The addition of the plastic will lower the sensitivity to distant leaks but apparently has little effect on the sensitivity to leaks close to the probe.

HEWLETT PACKARD hp DELCON DIVISION

ULTRASONIC TRANSLATOR DETECTOR™

Models 116, 117, and 118

Model 118 Ultrasonic Translator Detector, without cover.

LOCATE AIR AND GAS LEAKS QUICKLY

Delcon Ultrasonic Translator Detectors bring new simplicity to the detection of air and gas leaks in either pressure or vacuum systems. Each unit is as easy to operate as a flashlight, allowing even untrained personnel to detect leaks at more than 50 feet from the equipment under inspection. After a leak is detected, the directional probe quickly pinpoints the exact location more accurately than with old-fashioned bubble solutions.

Three models of the Ultrasonic Translator Detector are now available from Delcon; all three are completely portable and incorporate transistorized, spark-free circuitry to permit use in explosive atmospheres. Several accessories are available to increase the range and uses of these Detectors, including the Quik-Search Wand, which allows remote leak detection in inaccessible manifold systems or elevated lines. Another accessory, the contact probe, detects and locates bearing wear.

THE MODEL 118

The Model 118 Ultrasonic Translator Detector is shown at left with the cover removed. This model incorporates additional features, such as a sound intensity meter for visual readout or logging and a DC output for recorders, oscilloscopes, or other associated electrical devices. The choice of a built-in loudspeaker or auxiliary headphones allows this Detector to be used regardless of ambient noise levels. The probe and earphones can be carried in the removable cover, providing a compact and convenient package.

OPERATING PRINCIPLE

The Ultrasonic Translator Detector utilizes the ultrasonic energy generated by molecular collisions as gas escapes from or enters a small orifice. Since the directional probe is sensitive only to the ultrasonic frequency spectrum, audible background noises do not interfere with the detection process. The Detector's transistorized circuitry converts the probe output into audible sound and also gives (Models 117 and 118) meter readout.

The detector probe is highly directional, detecting ultrasonic disturbances within a 22-degree sensing cone. This directional characteristic allows the probe to be handled like a flashlight to search for and locate leaks. When the probe is pointed toward a leak, the sound from the headphones or speaker will increase; as the probe is moved closer to the leak, the sound will increase further in intensity. Precise location of the leak is thus accomplished quickly without special training or additional procedures.

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Three Detector Models for Detection Versatility

MODEL 116

MODEL 116

An economical, ultra-lightweight system

The Model 116 Ultrasonic Translator Detector is a practical, lightweight system which consists of the basic Detector unit, a directional probe, matching headphones, and a leather utility case.The instrument is shipped with mercury-cell batteries which provide from 360 to 500 hours of dependable operation. The Detector can be carried in a pocket or by the web carrying strap.

MODEL 117

Additional features, including an easy-to-read Dual-Scale Meter

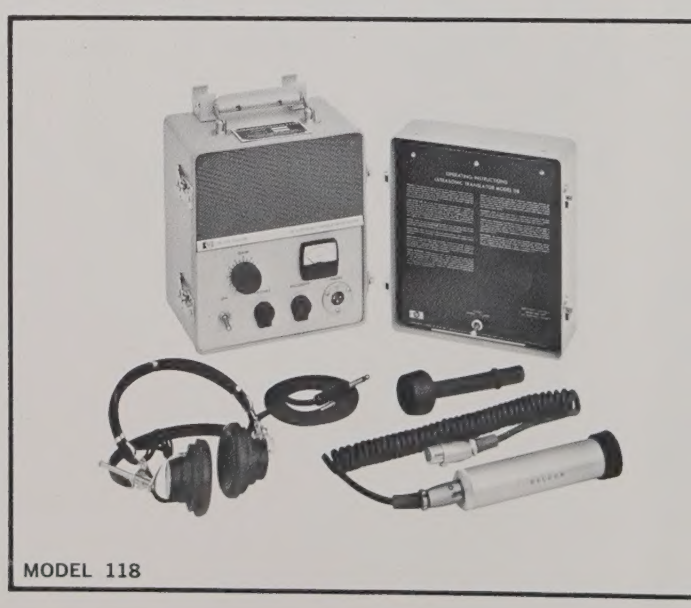
The Model 117 Ultrasonic Translator Detector incorporates a Dual-Scale Meter for quick visual reference of detected ultrasonic energy. The meter is calibrated in decibels to correspond to audio output and incorporates a scale for logging reference. The volume and power controls are separated to permit periodic testing at an established volume level. The Model 117 system includes the Detector instrument with heavy-duty carrying strap, a directional probe, matching headphones, and a leather utility case.

MODEL 118

A complete system — including loudspeaker — in a rugged aluminum cabinet

The Model 118 Ultrasonic Translator Detector incorporates all of the advantages of the other models, plus DC output and an integral loudspeaker. A separate battery compartment, containing mercury-cell batteries good for 500 to 700 hours, facilitates battery replacement without disassembly. Accessories can be stored in the removable cabinet cover, which is designed to fit the instrument only when the power switch is off.

MODEL 117



MODEL 118

Specifications

	Model 116	Model 117	Model 118
CONSTRUCTION:	Rugged aluminum construction throughout entire instrument. Separate battery compartment permits battery replacement without disassembly. Cabinet has detachable side plate for major servicing.		Cabinet has a detachable protective front cover with operating instructions and accessory storage.
CIRCUITRY:	Completely transistorized 4.5-volt circuitry for long battery life. Pull-Push switch and volume control are combined for ease of operation.	A separate ON-OFF toggle switch and standard volume control are provided.	Hermetically sealed power switch.
RESPONSE:	Frequencies between 36,000 and 44,000 cps are translated into audible sounds, while other sounds within the human hearing range are not detected by this instrument.		
PROBE:	A hand-held sensing probe having a conical directivity of 22° with a detachable 6 foot coiled cord is provided for general use.		
METER:	None	Ultrasonic sound intensity is measured by an output meter. Upper meter scale has a linear calibration for logging relative measurements; lower scale is calibrated in decibels.	
SPEAKER INPUT:	None	None	400 mw into a 4 x 6 integral loudspeaker.
PHONE JACK OUTPUT:	10 milliwatts into 600-ohm matched headphone. One volt RMS minimum.		
RECORDER JACK OUTPUT:	None	None	One milliampere DC current available.
SIZE:	4" x 7" x 1¾"	4" x 7" x 2⅜"	9" x 11" x 8½"
PROBE:	1⅜ inches diameter by 6¼ inches in length.		
BATTERIES:	3 cells of either mercury, alkaline manganese, zinc carbon, or rechargeable nickel cadmium type. Standard "A-A" flashlight size.		Standard "D" size.
BATTERY LIFE:	360-500 hours from mercury cells.		500-700 hours from mercury cells.
SYSTEM WEIGHT:	5 lbs (28 ounces Detector)	6 lbs (35 ounces Detector)	11 lbs
SHIPPING WEIGHT:	8 lbs	9 lbs	14 lbs

ORDERING INFORMATION:
Order Delcon Ultrasonic Translator Detectors by Model number and description (see page 2 for detailed information). Each Detector Model is shipped with mercury batteries installed, F. O. B. Palo Alto, California.

PRICES:

Model 116 . . $525.00
Model 117 . . $575.00
Model 118 . . $850.00

Model 112WC Quik Search Wand . . $185.00
Model 72007 Contact Probe $150.00

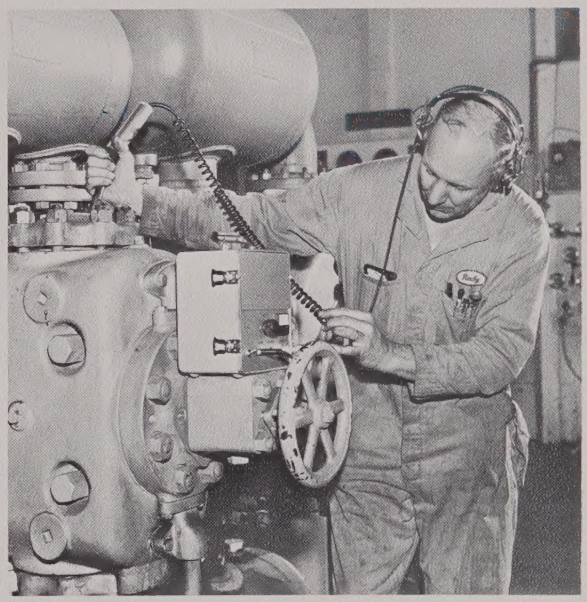
Rapid, Efficient, Detection for Many Applications

POSITIVE DETECTION IN SECONDS

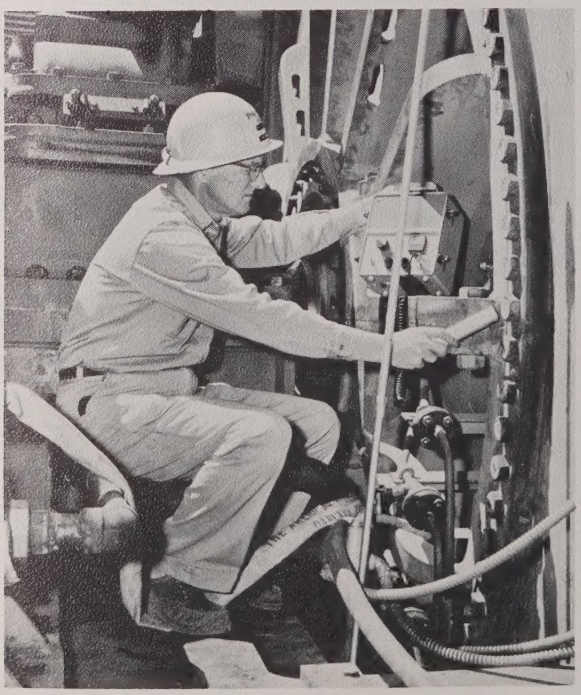
When leaks in pressure or vacuum systems are suspected, the fastest practical means of determining their location is by use of a Delcon Ultrasonic Translator Detector. This procedure does not require tracer or special gases or other complex techniques, and can be accomplished immediately without costly setup time. The Delcon Detector is more accurate than many tape-burst or sniffing techniques because its directional probe homes on the exact leak source. Indoors or out, even in high-noise or explosive environments, the Delcon Detector can locate leaks in bulkheads (below left), or in flange fittings (bottom right).

ECONOMY THROUGH EFFICIENCY

Literally hundreds of miles of piping and fittings can be checked in a normal working day. Plant downtime is saved since no special fluids or testing pressures are required in the pipelines. Operating pressures determine the minimum leak size that can be detected, as shown in the graph on page 6. Where necessary, high-pressure steam techniques can be used in oil lines to expose pinhole leaks by bringing them within graph range. As the graph indicates, Delcon Detectors will locate leaks as small as 0.003 inch — the size of a human hair!



Compressor valve defects can be located in seconds.



Vacuum envelopes can be checked as easily as pressure systems.

Ultrasonics detect leaks without interrupting plant operation.

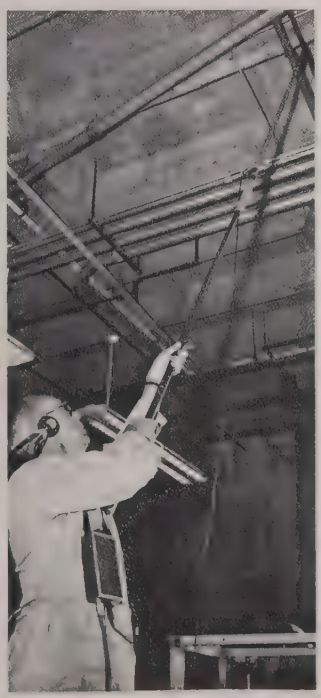
OPTIONAL ACCESSORIES COVER A WIDE RANGE OF APPLICATIONS

Ultrasonic energy is generated by many sources other than the molecular collisions characteristic of gas leaks. Often such sources can be used for useful measurements. As more and more applications are found for these versatile Ultrasonic Detectors, Delcon's versatile engineering staff develops Detector accessories for many specialized applications.

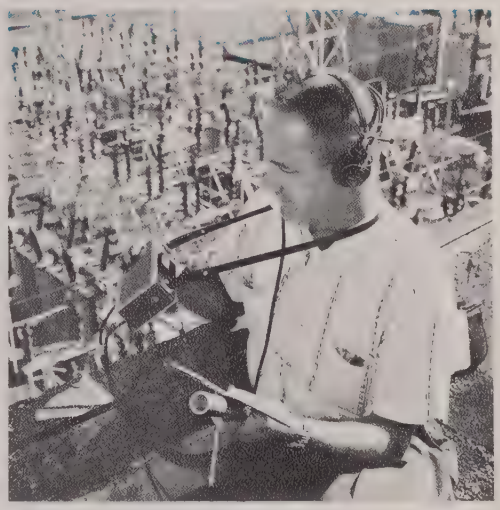
Friction, for example, creates ultrasonic energy which can be detected by the new contact probe. Even in very noisy environments where bearing noise is masked, the contact probe can detect wear by converting ultrasonic energy to audible sound. The sound output thus translated is surprisingly similar to audible bearing whine, which allows even untrained personnel to interpret and trace the worn areas.

Corona discharge from high-voltage electrical equipment also generates ultrasonic energy. The Delcon Detector is thus an ideal device with which to locate arcing in power stations, generators, and other associated equipment.

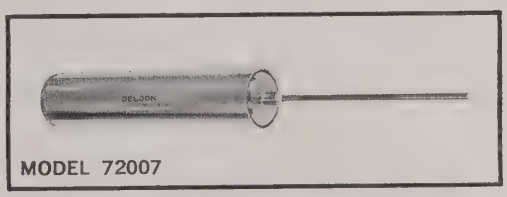
When a certain application requires semi-remote leak detection, the Delcon Quik-Search Wand can be used. This extended probe is five feet in length and houses the directional probe and a high voltage isolation transformer. When piping networks prevent proper access, or for overhead piping, the Quik-Search Wand provides accurate and remote scanning. Operators can also use the wand as an extended probe for added safety in dangerous environments.



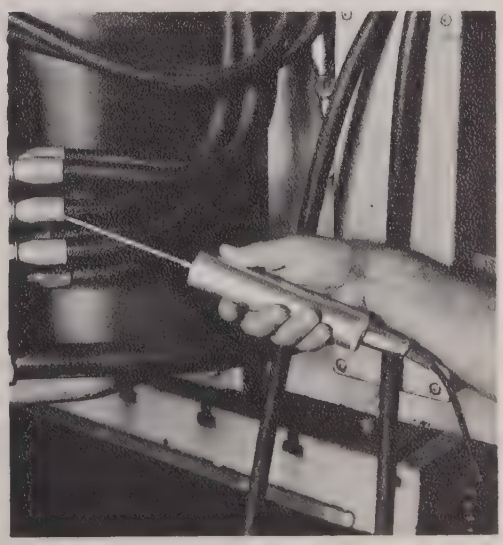
The Quik-Search Wand. For remote detection and to isolate the operator from dangerous environments.



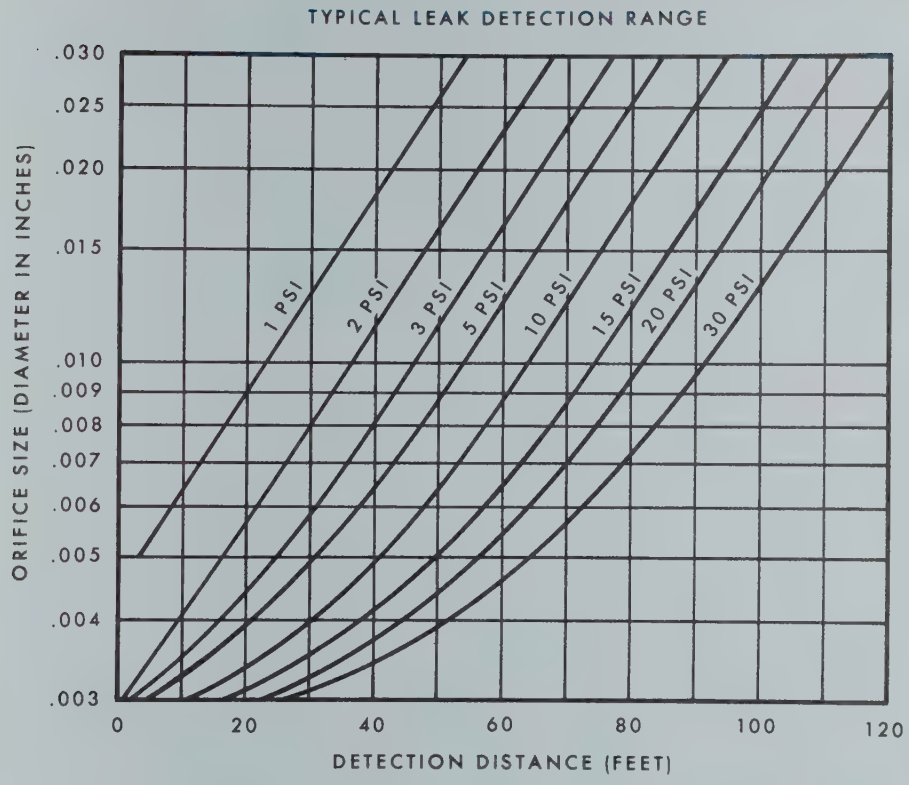
Inspecting sub-station for CORONA.



The Contact Probe. Detects ultrasonic energy through solids.



Using the contact probe to find leaks in a hydraulic system.



LEAK SENSITIVITY

The graph shown correlates approximate orifice size, pressure and detection distance for dry air; and applies only when internal cross section area of approach to the orifice is at least 20 times the area of the orifice.

EXAMPLE

A 0.010 inch diameter orifice in a container with more than 0.050 inch inside diameter, pressurized with dry air to 10 PSI can be detected at a distance of 64 feet. Other gases or humidity conditions may increase detection distance.

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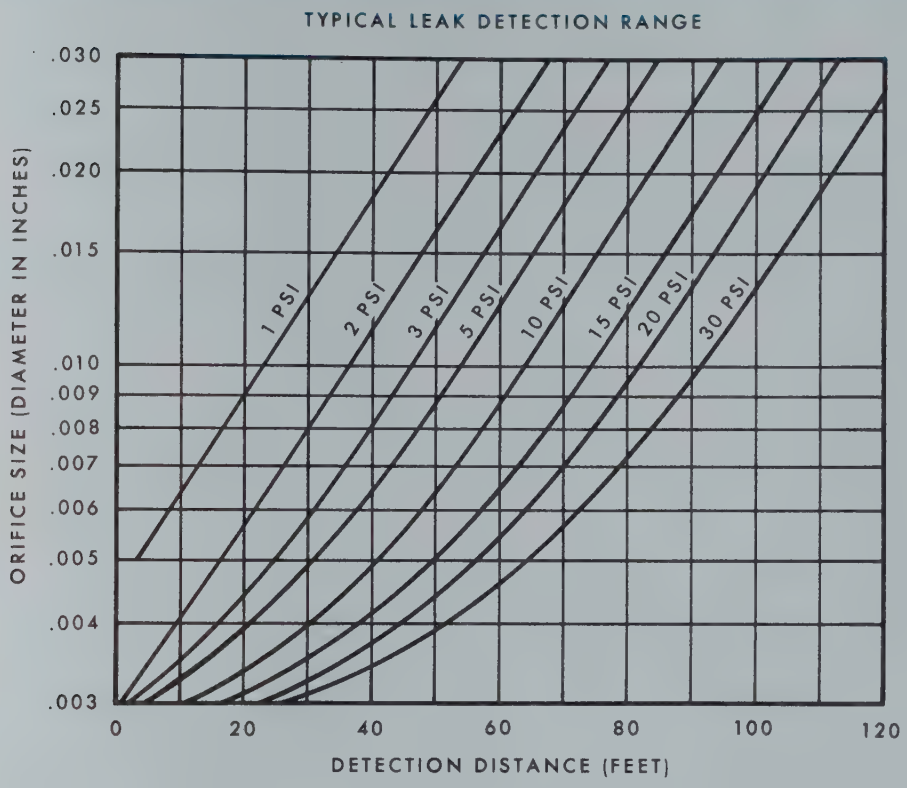

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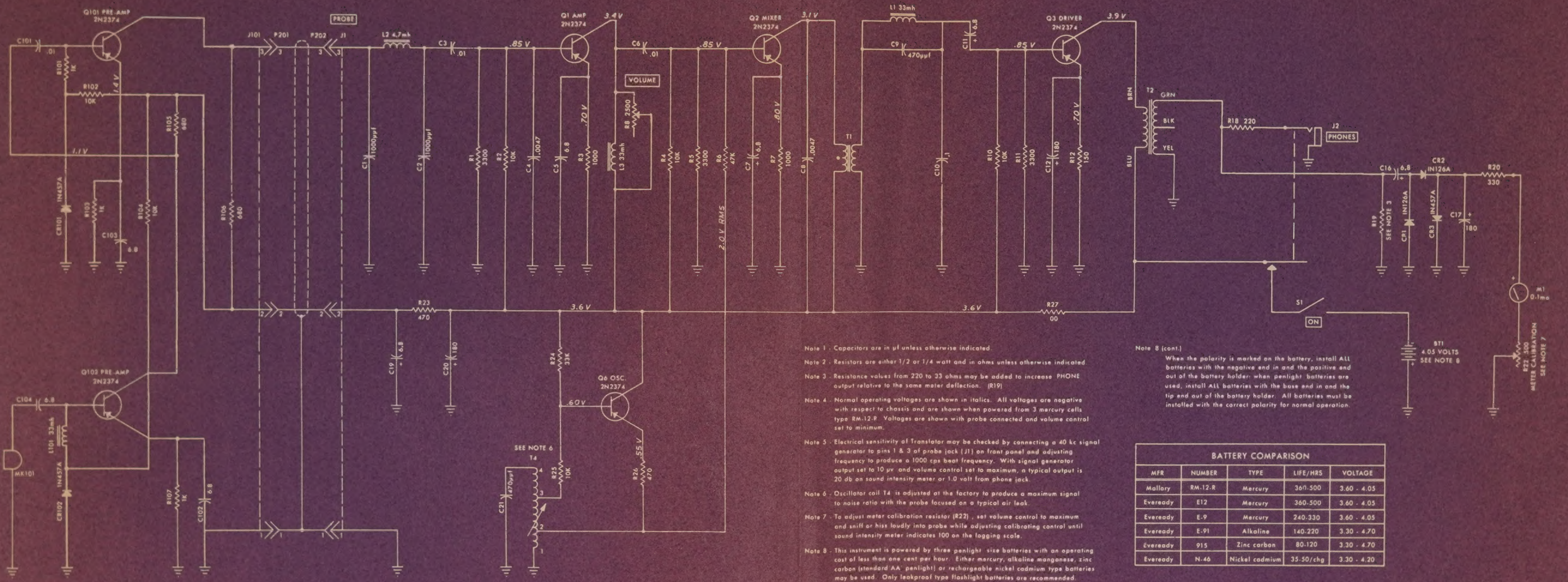


Note 1 - Capacitors are in μf unless otherwise indicated.

Note 2 - Resistors are either 1/2 or 1/4 watt and in ohms unless otherwise indicated.

Note 3 - Resistance values from 220 to 33 ohms may be added to increase PHONE output relative to the same meter deflection. (R19)

Note 4 - Normal operating voltages are shown in italics. All voltages are negative with respect to chassis and are shown when powered from 3 mercury cells type RM-12-R. Voltages are shown with probe connected and volume control set to minimum.

Note 5 - Electrical sensitivity of Translator may be checked by connecting a 40 kc signal generator to pins 1 & 3 of probe jack (J1) on front panel and adjusting frequency to produce a 1000 cps beat frequency. With signal generator output set to 10 μv and volume control set to maximum, a typical output is 20 db on sound intensity meter or 1.0 volt from phone jack.

Note 6 - Oscillator coil T4 is adjusted at the factory to produce a maximum signal to noise ratio with the probe focused on a typical air leak.

Note 7 - To adjust meter calibration resistor (R22), set volume control to maximum and sniff or hiss loudly into probe while adjusting calibrating control until sound intensity meter indicates 100 on the logging scale.

Note 8 - This instrument is powered by three penlight size batteries with an operating cost of less than one cent per hour. Either mercury, alkaline manganese, zinc carbon (standard AA penlight) or rechargeable nickel cadmium type batteries may be used. Only leakproof type flashlight batteries are recommended.

To change batteries, insert coin in slot in battery cover and remove. Spring tension on batteries will aid in removing cover and batteries, therefore caution is suggested to avoid losing cover.

Note 8 (cont.)

When the polarity is marked on the battery, install ALL batteries with the negative end in and the positive end out of the battery holder: when penlight batteries are used, install ALL batteries with the base end in and the tip end out of the battery holder. All batteries must be installed with the correct polarity for normal operation.

BATTERY COMPARISON				
MFR	NUMBER	TYPE	LIFE/HRS	VOLTAGE
Mallory	RM-12-R	Mercury	360-500	3.60 - 4.05
Eveready	E12	Mercury	360-500	3.60 - 4.05
Eveready	E-9	Mercury	240-330	3.60 - 4.05
Eveready	E-91	Alkaline	140-220	3.30 - 4.70
Eveready	915	Zinc carbon	80-120	3.30 - 4.70
Eveready	N-46	Nickel cadmium	35-50/chg	3.30 - 4.20

SCHEMATIC DIAGRAM

DELCON MODEL 117 ULTRASONIC TRANSLATOR

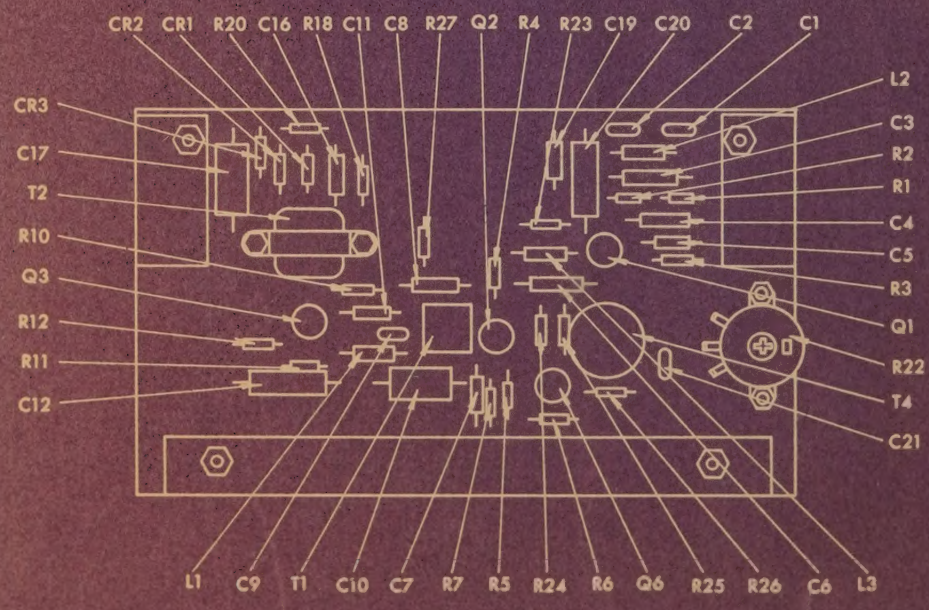
Serial number 170001 & up

SYMBOL	DESCRIPTION	P/N	MFG
BT1	Battery, mercury, 1.4 volts	E-12	14
BT2	Same as BT1		
BT3	Same as BT1		
C1	Capacitor, mica, 1000 μμf, ± 5%, 100 WVDC	DM15F102J	2
C2	Same as C1		
C3	Capacitor, .01 μf, ± 10%, 200 WVDC	192P10392	12
C4	Capacitor, .0047 μf, ± 10%, 200 WVDC	192P47292	12
C5	Capacitor, tantalum, 6.8 μf, 6 WVDC	150D685X	12
C6	Same as C3		
C7	Same as C5		
C8	Same as C4		
C9	Capacitor, mica, 470 μμf, ± 5%	DM15F471J	2
C10	Capacitor, 0.1 μf	192P10492	12
C12	Capacitor, tantalum, 180 μf, 6 WVDC	150D187X	12
C16	Same as C5		
C17	Same as C12		
C19	Same as C5		
C20	Same as C12		
C21	Same as C9		
CR1	Diode, germanium	1N126A	3
CR2	Same as CR1		
CR3	Diode, silicon	1N457A	11
J1	Receptacle, wall mount	XLR-3-32	4
J2	Jack, telephone	13A	13
L1	Inductor, 33 mh, ± 10%	WEE33000	8
L2	Inductor, 4.7 mh, ± 10%	WEE4700	8
L3	Same as L1		
M1	Meter, 0-1 ma, special scale	0815.001	7
Q1	Transistor, germanium	2NWE74	10
Q2	Same as Q1		
Q3	Same as Q1		
Q6	Same as Q1		
R1	Resistor, fixed composition, 3300 Ω, ± 10%, ½ W	CB 3321	1
R2	Resistor, fixed composition, 10 KΩ, ± 10%, ½ W	CB 1031	1
R3	Resistor, fixed composition, 1000 Ω, ± 10%, ½ W	CB 1021	1
R4	Same as R2		
R5	Same as R1		
R6	Resistor, fixed composition, 47 KΩ, ± 10%, ½ W	CB 4731	1
R7	Same as R3		
R8	Resistor, variable, 2500 Ω	ACS9-252U	5
R10	Same as R2		
R11	Same as R1		
R12	Resistor, fixed composition, 150 Ω, ± 10%, ½ W	CB 1511	1
R18	Resistor, fixed composition, 220 Ω, ± 10%, ½ W	CB 2211	1
R19	Resistor, factory selected value		
R20	Resistor, fixed composition, 330 Ω, ± 10%, ½ W	CB 3311	1
R22	Resistor, variable, 500 Ω	BL 2477	5
R23	Resistor, fixed composition, 470 Ω, ± 10%, ½ W	CB 1021	1
R24	Resistor, fixed composition, 33 KΩ, ± 10%, ½ W	CB 3331	1
R25	Same as R2		
R26	Same as R23		
R27	Resistor, fixed composition, 100 Ω, ± 10%, ½ W	CB 1011	1
S1	Switch, toggle with paddle handle	L62-A4	6

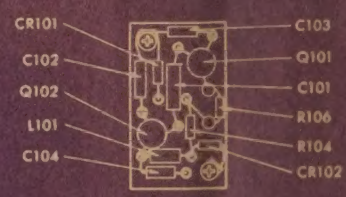
SYMBOL	DESCRIPTION	P/N	MFG
T1	Transformer, interstage, 400 Ω to 150 Ω	1201.007	7
T2	Transformer, interstage, 500 Ω ct to 600 Ω ct	1201.027	7
T4	Coil, oscillator, 30 mh	1201.019	7
C101	Capacitor, fixed polyester, .01 μf, ± 10%, 200 WVDC	192P10392	12
C102	Capacitor, electrolytic, 6.8 μf, ± 20%, 6 VDC	SA6R8DE	9
C103	Same as C102		
C104	Same as C102		
CR101	Diode, silicon	1N457A	11
CR102	Same as CR101		
J101	Receptacle, recessed, male	XLR-3-14	4
L101	Inductor, 33 mh, ± 10%	1537-782	8
MK101	Transducer, ultrasonic	0103.003	7
P201	Connector, cable	XLR-3-11C	4
P202	Same as P201		
Q101	Transistor	2N2374	10
Q102	Same as Q101		
R101	Resistor, fixed composition, 1000 Ω, ± 10%, ½ W	CB 1021	1
R102	Resistor, fixed composition, 10 KΩ, ± 10%, ½ W	CB 1031	1
R103	Same as R101		
R104	Same as R102		
R105	Resistor, fixed composition, 680 Ω, ± 10%, ½ W	CB 6811	1
R106	Same as R105		
R107	Same as R101		
W201	Assembly, cable, w/connectors	74009	7

LIST OF MANUFACTURERS

CODE	MANUFACTURER
1	Allen Bradley Company 136 West Greenfield Avenue Milwaukee, Wisconsin
2	Arco Electronics, Inc. Community Drive Great Neck, New York
3	Amperex Electronic Corporation 230 Duffy Avenue Hicksville, New York
4	Cannon Electric Company 3208 Humboldt Street Los Angeles 31, California
5	Chicago Telephone Supply Elkhart, Indiana
6	Circle "F" Manufacturing Company 720 Monmouth Street Trenton 4, New Jersey
7	Delcon Corporation 943 Industrial Avenue Palo Alto, California
8	Delevan Electronics Corporation 270 Quaker Road E. Aurora, New York
9	ITT Components Division P. O. Box 412 Clifton New Jersey
10	Philco Corporation Lansdale, Pennsylvania
11	Raytheon Manufacturing Company Semi-Conductor Division 900 Chemsford Avenue Lowell, Massachusetts
12	Sprague Electric Company 481 Marshall Street North Adams, Massachusetts
13	Switchcraft, Inc. 5555 North Elston Avenue Chicago 30, Illinois
14	Union Carbide Consumer Products Company 270 Park Avenue New York, New York



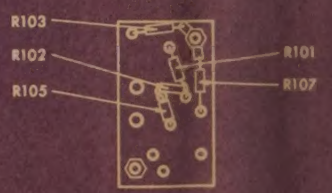
TRANSLATOR AMPLIFIER BOARD



TOP VIEW

PROBE PRE-AMP BOARD

BOTTOM VIEW



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